CLAIMS

1. Optical assembly with a laterally graded reflective multilayer (10,20) whose reflecting surface is to reflect incident X-rays under low incidence angles while producing a two-dimensional optical effect, characterized by the fact that said reflecting surface is comprised of a single surface, said reflecting surface being conformed along two curvatures corresponding to two different directions.

2. Optical assembly set forth in the preceding claim characterized in that the lateral gradient extends along the meridional direction of the incident X-rays.

3. Optical assembly as claimed in one of the preceding claims characterized in that the reflecting surface is smooth.

4. Optical assembly as claimed in one of the preceding claims characterized in that the two-dimensional optical effect is obtained by a single reflection of incident rays on the optical assembly.

5. Optical assembly as claimed in one of the preceding claims characterized in that said different directions correspond respectively to the sagital direction and to the meridional direction of the incident X-rays.

6. Optical assembly as claimed in one of the preceding claims characterized in that the multilayer is a depth graded multilayer.

7. Optical assembly as claimed in one of the preceding claims characterized in that said reflecting surface is adapted to reflect rays of Cu-K $\alpha$ peaks.

8. Optical assembly as claimed in one of the preceding claims characterized in that a first of said two curvatures defines a circle.

9. Optical assembly as claimed in any of claims 1 to 7 characterized in that a first of said two curvatures defines a curve different from a circle.

10. Optical assembly as claimed in the preceding claim characterized in that a first of said two curvatures defines an ellipse or a parabola.

11. Optical assembly as claimed in claims 1 to 7 characterized in that a first of said two curvatures defines an open or closed curve different from a circle, an ellipse or a parabola.

12. Optical assembly as claimed in one of the four preceding claims characterized in that the second of said two curvatures defines a circle.

13. Optical assembly as claimed in claims 1 to 11 characterized in that the second of said two curvatures defines a curve different from a circle.

14. Optical assembly as claimed in the preceding claim characterized in that the second of said two curvatures defines an ellipse or a parabola.

15. Optical assembly as claimed in claims 1 to 11 characterized in that the second of said two curvatures defines an open or closed curve different from a circle, an ellipse or a parabola.

16. Optical assembly as claimed in claims 1 to 7 characterized in that the reflecting surface has a geometry of substantially toroidal shape.

17. Optical assembly as claimed in claims 1 to 7 characterized in that the reflecting surface has a geometry of substantially paraboloidal shape.

18. Optical assembly as claimed in claims 1 to 7 characterized in that the reflecting surface has a geometry of substantially ellipsoidal shape.

19. Optical assembly as claimed in claims 1 to 7 characterized in that the reflecting surface has a geometry substantially circular in shape along a first direction, and elliptic or parabolic along a second direction.

20. Optical assembly as claimed in one of the preceding claims characterized in that the reflecting surface has a sagital curvature radius of less than 20 mm.

21. Optical assembly as claimed in one of the preceding claims characterized in that a window that is opaque to X-rays and containing an aperture is associated at the input and/or output of the optical assembly, in order to control the input and/or output flux of the optical assembly.

22. Optical assembly as claimed in the preceding claim characterized in that the windows are removable.

23. Optical assembly as claimed in one of the two preceding claims characterized in that the assembly comprises an aperture located at the input cross-section and the size and the shape of said aperture located at the input cross-section can be adjusted in order to control the incident flux.

24. Optical assembly as claimed in one of the three preceding claims characterized in that the assembly comprises an aperture located at the output cross-section and the size and the shape of said aperture located at the output cross-section can be adjusted in order to control the reflected flux.

25. Optical assembly as claimed in one of claims 21 to 22 characterized in that the apertures of the windows are dimensioned so as to realize a flux/divergence compromise of the radiation.

26. Manufacturing method of an optical assembly as claimed in one of the preceding claims, characterized in that the method includes the coating of a substrate already having a curvature, and the curvature of this substrate along a second different direction.

27. Method as claimed in the preceding claim characterized in that the direction along which the substrate already has a curvature corresponds to the sagital direction of the optical assembly.

28. Method as claimed in the preceding claim characterized in that said curvature of the substrate which corresponds to the sagital direction of the optical assembly defines a radius of curvature which is less than 20 mm.

29. Method as claimed in one of the two preceding claims characterized in that the direction along which the substrate is curved corresponds to the meridional direction of the optical assembly.

30. Method as claimed in one of the four preceding claims characterized in that said substrate has a roughness lower than 10 rms.

31. Method as claimed in one of the five preceding claims characterized in that the substrate itself is constituted, starting from an element in the form of a tube, cone, or pseudo-cone already having a curvature along a direction orthogonal to the axis of the tube, of the cone or of the pseudo-cone.

32. Method as claimed in the preceding claim characterized in that the element is a glass tube with a circular transversal cross-section.

33. Method as claimed in the preceding claim, characterized in that the glass is of the Duran type (registered trademark).

34. Method as claimed in one of the two preceding claims, characterized in that the constitution of the substrate includes the cutting of the tube along the longitudinal direction of the tube, in such a way as to obtain a substrate in the shape of an open cylinder.

35. Method as claimed in the preceding claim, characterized in that the cutting along the longitudinal direction of the tube is followed by cutting in order to dimension the optical assembly in length.

36. Method as claimed in one of the ten preceding claims, characterized in that the coating is performed in order to constitute a multilayer before curving the substrate.

37. Method as claimed in claims 26 to 35, characterized in that the substrate is curved in order to conform it to the geometry sought before coating it in order to constitute a multilayer.

38. Method as claimed in one of the twelve preceding claims, characterized in that the optical assembly is coupled to a filter, in order to provide attenuation of the undesired spectral bands while guaranteeing sufficient transmission of a predetermined wavelength band for which reflecting the incident X-rays is sought.

39. Method as claimed in the preceding claim, characterized in that the filter is a 10-μm Nickel filter.

40. Method as claimed in one of the two preceding claims, characterized in that the filter is realized by one of the following techniques:

- realization of two filters whose combined thickness corresponds to the filter thickness sought, positioned respectively on the input and output windows of the radiation of a protective housing containing the optical assembly,

- deposit of a layer of filtering material on the multilayer coating, with a coating thickness that is approximately given by the following relationship: $d = (e \sin \theta) / 2$ (where e is the required filter "optical" thickness and $\theta$ the angle of incidence on the optic).

41. Device for generating and conditioning X-rays for applications for angle-dispersive X-ray reflectometry including an optical assembly as claimed in one of claims 1 to 25 coupled to a source of X-rays in such a way that the X-rays emitted by the source are conditioned along two dimensions so as to adapt the beam emitted by the source in destination of a sample, with the X-rays having different angles of incidence on the sample which is considered.

42. Device as claimed in the preceding claim characterized in that the dispersion of angle incidences on the sample corresponds substantially to the angular dispersion along the sagital dimension of the beam reflected by the optical assembly.

43. Device as claimed in one of the two preceding claims characterized in that the optic is directed with regard to the sample in such a way that the normal in the center of the optical assembly is approximately parallel to the surface of the sample.

44. Device as claimed in one of the three preceding claims, characterized in that capture angle at the level of the sample is greater than 2° along a first dimension corresponding to the sagital dimension of the optical assembly and about 1° along a second dimension corresponding to the meridional dimension of the optical assembly, the optical assembly being positioned in such a way that the dispersion in angles of incidence of the X-rays on the sample is greater than 2°, the sample being positioned at a distance greater than 15 cm in relation to the optical assembly.